


FORM PTO-1390 U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE (REV. 11-2000)		ATTORNEY'S DOCKET NUMBER 31583-178427 RK
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		U.S. APPLICATION NO. (If known, see 37 CFR 1.5) Not Yet Assigned 10/069773
INTERNATIONAL APPLICATION NO. PCT/DE00/02887	INTERNATIONAL FILING DATE August 22, 2000	PRIORITY DATE CLAIMED August 30, 1999
TITLE OF INVENTION COUPLING MEDIUM FOR TRANSVERSAL ULTRASONIC WAVES		
APPLICANT(S) FOR DO/EO/US Frank VÖLKE, et al.		
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:		
<ol style="list-style-type: none"> 1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371. 2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371. 3. <input checked="" type="checkbox"/> This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below. 4. <input type="checkbox"/> The US has been elected by the expiration of 19 months from the priority date (Article 31). 5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)). <ol style="list-style-type: none"> a. <input checked="" type="checkbox"/> is attached hereto (required only if not communicated by the International Bureau). b. <input type="checkbox"/> has been communicated by the International Bureau. (attach form IB 308) c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US). 6. <input checked="" type="checkbox"/> An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)). <ol style="list-style-type: none"> a. <input checked="" type="checkbox"/> is attached hereto. b. <input type="checkbox"/> has been previously submitted under 35 U.S.C. 154(d)(4) 7. <input checked="" type="checkbox"/> Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)). <ol style="list-style-type: none"> a. <input type="checkbox"/> are attached hereto (required only if not communicated by the International Bureau). b. <input type="checkbox"/> have been communicated by the International Bureau. c. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. d. <input checked="" type="checkbox"/> have not been made and will not be made. 8. <input type="checkbox"/> An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)). 9. <input type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). 10. <input checked="" type="checkbox"/> An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)). 		
Items 11 to 20 below concern document(s) or information included:		
<ol style="list-style-type: none"> 11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. 12. <input type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included. 13. <input checked="" type="checkbox"/> A FIRST preliminary amendment. 14. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment. 15. <input type="checkbox"/> A substitute specification. 16. <input type="checkbox"/> A change of power of attorney and/or address letter. 17. <input type="checkbox"/> A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825 18. <input type="checkbox"/> A second copy of the published international application under 35 U.S.C. 154(d)(4). 19. <input type="checkbox"/> A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4). 20. <input type="checkbox"/> Other items or information: 		
20a. <input checked="" type="checkbox"/> For purposes of examination, please insert the annexes to the IPER, so that the application will comprise the following pages of the English translation: Specification: Original pages 1-3, Amended Pages 4-4a, Original Pages 5-9 Claims: Original claims Amended claims 1-5 in the annex to the International Preliminary Examination Report		

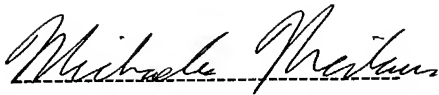
U.S. APPLICATION NO (if known, see 37 CFR 1.55) 10/069773		INTERNATIONAL APPLICATION NO PCT/DE00/02887		ATTORNEY'S DOCKET NUMBER 31583-178427 RK	
21. <input checked="" type="checkbox"/> The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5): Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO..... \$1040.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO..... \$890.00 International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$740.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) \$710.00 International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) \$100.00 ENTER APPROPRIATE BASIC FEE AMOUNT =				CALCULATIONS PTO USE ONLY	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	\$	
Total claims	5 - 20 =	0	x \$18.00	\$0.00	
Independent claims	1 - 3 =	0	x \$84.00	\$0.00	
MULTIPLE DEPENDENT CLAIMS(S) (if applicable)			+ \$280.00	\$	
TOTAL OF ABOVE CALCULATIONS =				\$890.00	
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				\$	
SUBTOTAL =				\$890.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	
TOTAL NATIONAL FEE =				\$890.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				\$	
TOTAL FEES ENCLOSED =				\$890.00	
				Amount to be refunded:	\$
				charged:	\$
a. <input checked="" type="checkbox"/> A check in the amount of \$890.00 to cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>22-0261</u> . A duplicate copy of this sheet is enclosed. d. <input type="checkbox"/> Fees are to be charged to a credit card. WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038. NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137 (a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO:			 SIGNATURE		
VENABLE P.O. Box 34385 Washington D.C. 20043-9998 Phone No. 202-962-4800 Fax No. 202-962-8300			Robert Kinberg NAME 26.924 REGISTRATION NUMBER		
			February 28, 2002 DATE		

CERTIFICATION

I, the undersigned, am a professional translator, fully competent to translate from German into English, and I declare hereby that the attached English rendition of the International Application PCT DE00/02887 entitled

Coupling Medium For Transverse Ultrasonic Waves

is a genuine translation, accurate in every particular, to the best of my ability and knowledge of the German text attached.



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Jan. 21, 2002

Date: -----

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Frank VOLKE et al.

Appl. No. Not Yet Assigned

Filed: February 28, 2002

For: COUPLING MEDIUM FOR
TRANSVERSE ULTRASONIC
WAVES

Int'l. Appln. No.: PCT/DE00/02887

Int'l. Filing Date: August 22, 2000

Atty. Docket No. 31583-178427

Customer No.



26694

PATENT TRADEMARK OFFICE

Preliminary Amendment

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to calculation of the fees, please amend the claims attached to the international application as follows:

IN THE CLAIMS:

5. (Amended) A coupling agent according to claim 3, wherein said mixture is composed solely of biocompatible substances.

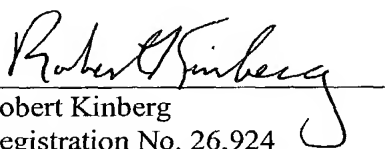
Applicant(s): Frank VOLKE et al.

REMARKS

This Preliminary Amendment is made to eliminate multiple claim dependency. Examination on the merits of the application is requested. A marked up version showing the changes made to claim 5 is attached.

Respectfully submitted,

Date: February 28, 2002


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Applicant(s): Frank VOLKE et al.

Claim 5 has been amended as follows:

- 3-

Coupling Medium for Transverse Ultrasonic Waves

The present invention relates to a novel coupling agent for transverse ultrasonic waves, such as are, for example, employed in the field of material testing.

The use of transverse ultrasonic waves in non-destructive material testing occurs by means of respective transverse ultrasonic wave transducers mounted on the surface of the test piece. Measuring may occur using a pulse-echo method or a transmission process. The elastic constants of the test piece material, for example, can be measured from the transit times of the ultrasonic pulses.

Coupling of transverse ultrasonic waves into the test piece requires a corresponding coupling agent between the transmitting respectively the receiving transducer and the surface of the test piece. Although numerous coupling agents for coupling in longitudinal sound waves are known in the art, for example, providing corresponding materials for coupling in transverse sound waves presents major problems. Such coupling agents must possess sufficient shear stability therefore, for example, water is unsuitable.

J. Krautkrämer et al. : "Werkstoffprüfung mit Ultraschall", 5th ed. 1986, Springer, page 297, mentions, in particular, viscous materials, such as cable impregnation media,

However, all these materials do not possess satisfactory properties and frequently cannot be reproducibly provided. In particular, employing gear lubricant oil is, according to own tests, only successful in the lower ultrasonic frequency range ($<1\text{MHz}$). In higher frequency ranges between 1 and 20 MHz such as are utilized in material testing, the oil is not suited for coupling in transverse ultrasonic sound waves.

Another substance known in the art as a coupling agent for transverse ultrasonic waves is honey. However, honey as well as glue cannot be reproducibly produced, are unpleasantly sticky and cannot be easily completely removed from the surface of the test piece. Moreover, commercially available media for coupling in transverse ultrasonic waves produced on a honey basis and whose appearance has been altered by colorants are expensive.

An essential property that a coupling medium for transverse ultrasonic waves should possess is that it be reproducibly

producible and the ability to be able to generate a very thin layer of this medium between the probe and the surface of the test piece. The reason therefor is the principle of transit time measurement. The overall transit time of the sound between the transmitting transducer and the receiving transducer is composed of the portions of the transit time of the sound in the individual components of the system, i.e. in the case of transmission measurement of the transit time in the coupling layer between the transmitting transducer and the test piece, the transit time in the test piece and the transit time in the coupling layer between the test piece and the receiving transducer. Therefore, for accurate measurement it is necessary to either know the thickness of the coupling media and the sound velocities occurring therein exactly or to generate an extremely thin, only a few atom layers thick coupling layer, whose transit time portion is negligible for measurement precision.

These requirements in particular present problems in the state-of-the-art coupling agents. On the one hand, their sound velocity is not always known, on the other hand they cannot be generated with a defined thickness between the surface of the probe and the test piece, which, for example, is only dependent on the pressure force of the transducer on the probe. The frequently employed honey-based coupling medium forms crystals when pressed so that the thickness of this coupling layer differs from measurement to measurement, thus is undefinable. Crystal formation depends on non-controllable peripheral conditions

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such as temperature, humidity, water content, etc. Moreover, coupling media for longitudinal ultrasonic waves, such as in particular used in medical diagnosis are known from the state of the art. US 4, 905, 700 describes an ultrasonic coupling medium, which comprises a hydrogel foil, with a water content of >90% and polysaccharide, for examining the human body.

Furthermore, JP 07/124154 discloses a contact medium, comprising a gel composed of polysaccharides, for ultrasonic applications in medical diagnosis. The water content of the gel lies above 80%. In this case, too, the field of application being medical diagnosis, the coupling medium is for longitudinal ultrasonic waves, but not a coupling medium for transverse ultrasonic waves.

The demands on a coupling medium for transverse ultrasonic waves distinctly differ from the demands on a coupling medium for longitudinal waves so that the coupling media mentioned in the cited printed publications are completely unsuited for coupling transverse ultrasonic waves.

On the basis of these problems of the state of the art, the object of the present invention is to provide a coupling medium for transverse ultrasonic waves that possesses good coupling properties for transverse ultrasonic waves,

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is reproducible and its thickness between the surfaces of the probe and the test piece can be reproducibly set. This object is solved with the medium of claims 1 respectively 3. Advantageous embodiments are described in the subclaims.

A key element of the invention is that it was recognized that a homogeneous mixture of a polysaccharide, a surface-active substance and water is excellently suited as a coupling medium for transverse ultrasonic waves, with polysaccharides also including disaccharides. Such a medium can be easily produced in a reproducible manner and possesses excellent coupling properties. The coupling medium of this composition is white and creamy, thus has a pleasant consistency and appearance. This medium can be colored as desired and is durable. Moreover, it can be easily removed from the surface of the test piece with water.

With the invented coupling medium, transverse ultrasonic waves can be coupled into materials of different composition,

for example skin, surfaces of solids, test pieces, etc. The coupling medium reacts excellently to shear forces and coupling performance is comparable to the previously used but not standardized coupling media such as glue and honey. Furthermore, it is a very economical variant of a coupling medium.

In a preferred embodiment, solely non-toxic and biocompatible polysaccharides and surface-active substances are employed.

The invented coupling medium has the particular advantage that its thickness can be reproducibly set following application to the surface of the test piece or the probe. This thickness can be generated by a defined pressure force of the probe onto the surface of the test piece. Applying the same pressure in each measurement yields the same layer thickness of the coupling medium. Moreover, with the coupling medium, very thin layers of only a few atom layers can be generated between the surfaces of the probe and the test piece so that the transit time of the ultrasonic wave in this coupling layer is negligible.

A special feature of the present invention is the reproducible, low acoustic attenuation of the developed coupling medium, with the transmitted portion of the sound waves increasing in comparison to the agents known in the state of the art.

This is achieved by means of the settable, infinitesimal thickness of the coupling layer and by means of the low attenuation coefficients of the material. In this manner, with given excitation energy, higher intensity is at disposal inside the probe so that deeper lying structure become detectable at all or better.

The mixture ratios of water, surface-active substance and polysaccharide lie preferably in the range from 10 to 30 weight percent for water, from 10 to 30 weight percent for the surface-active substance and from 40 to 80 weight percent for the polysaccharide.

Preferably the polysaccharides are, starch, hyaluron acid, polyglucane, amylose, dextrin and disaccharides such as sucrose, saccharose and trahalose. Lipids, aerosol-OT, phospholipids and glykolipids are preferably employed as surface-active substances.

The especially good transmission of the shear forces is particularly yielded by the three-dimensionally linked molecular structure which forms in the invented mixture and immobilizes the water sufficiently molecularly in the microspaces.

In the following, a preferred embodiment of such a coupling medium is described. A mixture of aerosol-OT with a weight per cent of 22, trehalose with a weight per cent of 56 and water with a weight per cent of 22 is produced in the following steps:

1. Production of an aerosol-OT dispersion with little water for creating a high-viscous dispersion.
2. Stepwise addition of trehalose and water while stirring until a homogeneous mixture is yielded.

THE UNIVERSITY OF CHICAGO

1. Use of a homogenized mixture of at least one polysaccharide, a surface-active substance and water in a creamy consistency as a coupling medium for transverse ultrasonic waves.
2. A use according to claim 1, wherein a layer of the mixture is applied between a surface of a probe and a surface of a transmitting respectively receiving transducer for transverse ultrasonic waves and said two surfaces are pressed together.
3. A coupling medium for transverse ultrasonic waves, comprising a homogenized mixture of at least a polysaccharide, a surface-active substance and water, with said mixture having a creamy consistency.
4. A coupling agent according to claim 3, wherein said mixture is composed of a maximum of 50% water.
5. A coupling agent according to claim 3 or 4, wherein said mixture is composed solely of biocompatible substances.

Abstract

The present invention relates to a novel coupling medium for transverse ultrasonic waves.

The coupling medium comprises a homogenized mixture of a surface-active substance, a polysaccharide and water, which has a creamy consistency.

The mixture is reproducibly produced, has a pleasant consistency and optical appearance and is easily removable from the probe.

DECLARATION FOR UNITED STATES PATENT APPLICATION
POWER OF ATTORNEY, DESIGNATION OF CORRESPONDENCE ADDRESS

Attorney Docket
31583-178427 RK

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name, and that I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled COUPLING MEDIUM FOR TRANSVERSAL ULTRASONIC WAVES, the specification of which

[] is attached hereto.

[] was filed on _____, as Application Serial No. _____, Confirmation No. _____, and was amended on _____ [if applicable].

[X] was filed under the Patent Cooperation Treaty on August 22, 2000 Serial No. PCT/DE00/02887, the United States of America being designated.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, 119 of any foreign application(s) for patent, utility model, design or inventor's certificate listed below and have also identified below any foreign application(s) for patent, utility model, design or inventor's certificate having a filing date before that of the application(s) on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed	
Number	Country	Date Filed	Yes	No
199 41 198.0	GERMANY	August 30, 1999	X	

I hereby appoint the attorneys and agents of VENABLE associated with the following customer number to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:



26694

PATENT TRADEMARK OFFICE

VENABLE is located at Suite 1000, 1201 New York Avenue, N.W., Washington, D.C. 20005-3917, Telephone: (202) 962-4800, Telefax: (202) 962-8300. Address all correspondence to VENABLE, Post Office Box 34385, Washington, D.C. 20043-9998.

The undersigned hereby authorizes the U.S. attorneys identified herein to accept and follow instructions from the undersigned's assignee, if any, and/or, if the undersigned is not a resident of the United States, the undersigned's domestic attorney, patent attorney or patent agent, as to any action to be taken in the Patent and Trademark Office regarding this application without direct communication between the U.S. attorneys and the undersigned. In the event of a change in the person(s) from whom instructions may be taken, the U.S. attorneys identified herein will be so notified by the undersigned.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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First/Joint Inventor: Frank VOLKE
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Residence and Post Office Address: Wolfsholstrasse 44, D-66386 St. Ingbert, Germany

Date: 22 March, 2002.

Signature: [Signature]
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Citizenship: GERMANY
Residence and Post Office Address: Theresienstrasse 39, D-66386 St. Ingbert, Germany

Date: 22 March, 2002.